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THE CARNEGIE-UNIVERSITY OF ALBERTA JOINT PROJECT ON EDUCATIONAL RESEARCH: A REPORT AFTER FIVE YEARS

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In 1956, the Carnegie Corporation of New York announced the award of \$50,000 to the University of Alberta as a stimulus to its research program. This award to further the work of the Alberta Advisory Committee on Educational Research (AACER) was to extend over a five-year period. It is now time to ask what has been accomplished and what lies ahead for educational research in this Province.

In 1953, three years prior to the award of the Carnegie grant, a meeting of representatives of the University of Alberta, the Department of Education, the Alberta Teachers' Association, the Alberta School Trustees' Association, and the Alberta Federation of Home and School Associations met to form the AACER. It was agreed that the Committee would restrict itself to encouragement, advice and securing financial support for educational research, leaving to the Faculty Committee on Educational Research (FCER) the conduct of research projects. In its submission to the Carnegie Corporation in 1956, the University of Alberta was able to cite the following accomplishments of the AACER in the first three years of its existence:

1. Development of a widely based joint sponsorship of educational research by the five major organizations with province-wide interest and responsibility in education: the University of Alberta, the Department of Education, the Alberta School Trustees' Association, the Alberta Teachers' Association, and the Alberta Federation of Home and School Associations.
2. Provision of an assured income to maintain a limited research program, and to publish a quarterly research journal.
3. Organization of cooperating research ventures involving university staff members, Department of Education officials, superintendents of schools, principals and teachers.
4. Encouragement of leadership in research by staff of the Faculty of Education, Department of Education officials, superintendents and teachers.
5. Editing and publishing of *The Alberta Journal of Educational Research*.

Notwithstanding these modest achievements, it was evident from the beginning that the extent of financial support was not proportional to the increasing need for research, the training of research work-

ers, and an expanded program for the dissemination of research findings. While conceding that the University had staff, library facilities, and a graduate school to draw upon, the creation of the AACER as a coordinating body would, by its very existence, serve to increase the quantity and quality of research under the guidance of the FCER. It was also thought that this increase in research activity would stimulate such local support of the AACER program as ultimately would make the organization self-sustaining. Something was needed however to stimulate this initial acceleration of research activity. To this end the assistance asked from the Carnegie Corporation was directed towards facilitating the research efforts of the AACER/FCER by three major means: increased research grants-in-aid, the provision of research fellowships, and an expanded program to make the public aware of research findings. The requested assistance was arranged to provide financial aid on a sliding scale in accordance with a planned program of increasing support for research from AACER/FCER, to the extent that, at the end of the five year period, marking the end of the Project, the program would be completely self-sustaining.

The effect of the Carnegie grant was immediately apparent. At the end of the first year of the Project, the expenditures of the AACER were \$17,510 as against \$2,724 spent the previous year. During the last year of the Project, expenditures were \$22,117. The growth of the Capital Account was equally encouraging. Through the planned assignment of small amounts from the Current Account plus designated donations of contributors, the Capital Account was increased from \$1,925 in September, 1956, to \$16,335 by September, 1961. During the five years of the project, the sum of \$31,463 was provided for research grants-in-aid. This figure attains special significance when it is compared with the \$1,009 awarded as research grants-in-aid during the three years prior to the initiation of the Project.

The publication program of the AACER has been expanded. *The Alberta Journal of Educational Research* has maintained the high standard set for it and has become internationally known. Honoring its commitment to the Project, the Committee has published the *Alberta Research Newsletter*. The acceptance of this publication, carrying as it does the news of research to a public heretofore not reached, has exceeded expectations. In 1959, the Committee published its first Monograph in Education: *Composite High Schools in Canada* (edited by Andrews, J. H. M., and A. F. Brown). This publication was followed in late 1960 and early 1961 by five additional monographs: *School Examination Practices and Standards in Alberta* (MacArthur, R. S. and S. Hunka); *The Al-*

berta Teacher Force in 1957-58 (MacArthur, R. S. and S. A. Lindstedt); *Theory and Practice Governing the Time of School Entrance* (Dey, Jean D.); *Rural Alberta: Patterns of Change* (Uhlman, Harold J.); *Pupil Personnel in Alberta Secondary Schools* (Black, D. B., R. S. MacArthur, and J. G. Paterson).

Aided in part by the Project, gains have been made in the graduate studies programs of the Faculty of Education. During the five years of the Project eleven research fellowships have been awarded; eight to doctoral and three to master's candidates. Under the terms of the Project agreement, the University was to assume full financial responsibility for two fellowships while the Committee was to contribute towards a third. By the end of the fourth year of the Project, the University had assumed full responsibility for all non-designated fellowships. From two research fellows in the Faculty during the first year of the project the number of fellows will increase to thirty-eight in the 1962-63 University winter session. No small credit is due to the Project for this gain. Moreover, the ready placement of graduate students in senior positions both inside and outside the Province provides a source of encouragement to the Faculty and the University.

These, then, are the concrete outcomes of the Project, but the most far-reaching effect may lie in areas in which the Project has played an indirect part. Several examples of this indirect, but none-the-less real influence may be cited. For example, during the period of the Project, enrolments in the Faculty of Education have soared. At the same time admission qualifications of incoming freshmen have been progressively raised. This expansion so quickly overloaded existing facilities that the provision of new ones became imperative. In the face of documented evidence supporting the arguments for expanded facilities, a multi-storey Education Building has been authorized for the Edmonton campus. Most significant in this new building, to be completed within two years, is the assignment for educational research of one floor, 8,400 square feet, in the office tower. Other features of this building, now under construction, reflect the research orientation of the teacher education program in this Province.

There has been a marked change in approaches to teacher education. Much of this change can be directly attributed to the existence of an active research program existing in an atmosphere where such activities are openly encouraged by the administration. Credit is also due to the Alberta Royal Commission on Education headed by Senator Donald Cameron. It was the experience of the commissioners that generally factual evidence on critical educational problems while sorely needed was too often lacking. In an at-

tempt to secure needed evidence, the Cameron Commission decided to conduct an active research program. It was not surprising that the Commission should draw upon local research workers who had gained experience afforded by Project research grants-in-aid. It was the interest of this Commission in research as a basis for making recommendations that distinguished its final report. The fact that this Commission was able to draw heavily upon pertinent research data already completed and, what is more important, could carry forward a highly successful research program of its own within the short period of its existence attests in no small way to the success of the Project. Further, the Commission was so convinced of the need for factual data as the basis for making sound educational decisions that it devoted special attention through its recommendations to the provision of a greatly expanded program of educational research for this Province. Further mention will be made below concerning this challenging blueprint for the expansion of educational research.

Another indirect influence of the Project on Provincial and National education has become apparent in recent educational conferences. The number of research-orientated papers presented at these conferences by Albertans or by Alberta-trained educators has been impressive. A case in point is Conference Study Guide No. 7, *Research in Education*, published by the Canadian Conference on Education. Four of the six articles were by Albertans. The dominance thus indicated is likely to increase rather than to diminish. The attitudes which are responsible for this result have not been achieved through mere verbalization of philosophical points of view. Rather, this research orientation demands for its care and nurture, involvement in the conduct and application of research. On the one hand, the conduct of research develops an increased sophistication in research design; on the other, it develops an appreciation of research done by others and an understanding of the significance of subsequent problems which arise through the conduct of original research. Most of all, the conduct of research develops an attitude towards research on the part of the investigator that permeates the professional life of the individual. Without the facilitating structure of a supporting grant-in-aid program, these desirable goals would be difficult to achieve. In perspective, the Alberta program for the encouragement of educational research has moved far in the direction of a scientific approach to education and its problems. In this accomplishment much of the impetus was given by the Project.

Viewed in the above terms, the Project has been successful. Its short term goals in all but one instance have been achieved or surpassed. But has this progress been enough?

One expectation of the originators of the Project has not been fully realized. It had been expected that, under the stimulus of a greatly expanded research program, increased contributions from local sources would make the AACER program self-sustaining. It cannot be denied that local contributions have increased markedly during the past five years; so have the costs of research.

The committee has made every effort to secure contributions from local sources; however, it also is sympathetic to the problems of potential contributors who must operate within fixed budgets. The increase in the contributions of the Alberta Teachers' Association and its locals has been a constant source of encouragement. The increase of the contribution of the University of Alberta from \$2,000 to \$5,000 per year by way of grants, supplemented as it is by way of staff, scholarships and fellowships, is substantial. The support of the Department of Education, while increasing from \$500 to \$750 per year over the course of the Project, has been disappointingly low, particularly in view of an active public relations program to bring the work of the Committee to the attention of the Government and in view of the strong recommendations of the Alberta Royal Commission on Education. During the last two years of the Project, the Government has changed its system of awarding grants to school authorities. This Foundation Plan has resulted in a sharp curtailment of contributions from local school boards from whom increasing support has been expected.

Another problem that appears to herald further problems relates to the spectacular growth in university enrolments, and particularly in the Faculty of Education at the University of Alberta. By way of illustration, during the first year of the Project (1956-57) 1,098 full-time students were enrolled in the Faculty of Education. In the last year of the Project (1961-62), 2,804 students were enrolled as full-time students exclusive of those in the Evening Credit and Summer Session programs. Because of rising enrolments and the inability to provide sufficient staff of the required calibre in accordance with these enrolments, the time normally available to research has to a large measure been absorbed by the necessity of maintaining the teaching program. By way of illustrating the impact of these trends on educational research, during the last year of the Project only 37% of the sums authorized as research grants-in-aid were in actual fact spent.

Another serious impediment to the Project and perhaps the one most frequently cited by the contributors, has been its failure to apply research findings in the field. There seem to be two aspects to this criticism. The first lies in the area of public relations. Repeatedly when appealing for funds, from the Provincial Government

in particular, the question has been asked, "Can you show me one instance where research has influenced educational practice in this Province?" This is an extremely difficult question to answer for the gains of educational research like those of any other science are often small and imperceptible, accumulating so quietly that, after a period of time, a change in educational practice has taken place unnoticed. This change in position is diametrically opposed to the single spectacular experiment which in the past has caused educational change, but often with detrimental effects. Moreover, it has been the policy in the past of the Committee to encourage as many individuals as possible to participate in research. This position is based on the belief that a research orientation of staff can only be truly engendered by the conduct of research in the particular field of interest of the individual. Yet it cannot be denied that the Committee, apart from its two periodical publications noted earlier, has not made any planned dramatization of the application of research findings in every instance. Perhaps the ways of the professional advertiser while alien to the practicing research worker are essential to a financially sound self-supporting research program.

The second area of complaint has been the failure of the Committee to provide for field consultant services. It cannot be denied that an active field service program identified with the Committee would constitute the best single way of making it apparent to the supporting agencies that the local contributions are of local value. However, as the Faculty of Education is presently constituted, the request for field services is not directed to the Committee, but rather to individual specialists on staff. Consequently, the relationship between the Committee and the specialist is a remote one, existing only in the facilitation of the individual's furtherance of his own competencies through research grants-in-aid.

What then for the future? There can be little doubt of the need now, more than ever before, for more educational research at all levels of education. This will necessitate much more encouragement and support for research. The Alberta Royal Commission on Education, basing its recommendations on what already has existed and what already has been accomplished in this Province, has provided a challenging blueprint for the future development of research. It is not the intention of the writers of this Report to elaborate upon the outline provided by the Commissioners other than to note that the plan calls for the provision of space, equipment, and a guaranteed yearly financial income to ensure stabilization of the research program. The first part, the provision of adequate quarters for research, has already been planned and will be a reality in 1963 upon the completion of the new Education Building on the Edmon-

ton campus. It is estimated that capital costs for the equipment of the new research facilities will range between \$175,000 and \$200,000 while the annual operating costs will be in the neighborhood of \$150,000 with the Provincial Government supplying two-thirds of this amount. The remainder will come from the usual sources as at present. Apart from these direct recommendations for greatly increased support in aid of research, the major problem will be the provision of staff to man such an establishment. While there is adequate staff within the Faculty already to staff an expanded research program, the replacement of staff so seconded would constitute a greater problem in the last analysis than the employment of adequately trained staff.

In summary, the progress in educational research supported under the terms of the Project has been most encouraging. The goals of the Project have been for the most part attained. The goal of complete financial support at the local level has fallen short of original expectations due partly to trends toward the effecting of economies in educational spending. It has been evident that the University of Alberta, the AACER and the Carnegie Corporation of New York have more than lived up to their part of the agreement. The efforts of the AACER and the University have already been noted. The Carnegie Corporation, on its part, has provided beyond the terms of the Project travel grants to permit three Faculty members to visit American institutions and organizations engaged in educational research. There can be no denying that without the existence of Project, many of the salient features of our program would have been long in coming. Only time will tell how sound the foundations of educational research established under the Project really are. Only time will tell the extent to which the challenge for a greatly expanded research program as recommended by the Alberta Royal Commission has been accepted. The past five years have been important ones for research in this Province. That the Carnegie Corporation has shown confidence in us during these five years, gives us confidence to approach the challenge of the future.

APPENDIX A: Distribution of Carnegie Funds during Joint Project

Year of Project

	1956-57	1957-58	1958-59	1959-60	1960-61
Carnegie Grant					
(U.S. dollars) ...	13,500	11,500	10,650	8,300	6,000
(Cdn. dollars) ...	13,275	10,987	10,240	7,963	5,884
Fellowships	5,000(5,000)*	4,500(4,500)	4,000(4,000)	3,000(3,000)	‡(2,000)
Staff:					
Sec.-Librarian...	1,873(2,000)	‡(1,800)	(1,500)	(1,200)	(900)
Director			‡(1,000)	(750)	(500)
Editor		500	500	1,000	1,000
Library	1,000(1,000)	750(750)	‡(250)		
Publications:					
Journal					
Newsletter	500(500)	250(250)	500‡(150)	400(100)	2,000§
Monographs					
Research					
Equipment	500(500)	0(250)	250†	250	250
Research					
Project	4,402(4,500)	4,987(4,000)	4,990	3,313(3,000)	2,634(2,500)
TOTAL	13,275	10,987	10,240	7,963	5,884

*Amount Proposed in Project proposal in parentheses.

Notes:

‡University assumed full responsibility for this item at this point.

†Heavy equipment rental charges seemed eligible for Project support although not originally budgeted.

§Increased tempo of the publications program needed further support beyond that originally budgeted particularly in 1960 when because of Monograph program the total year's publications costs were \$9,419.

APPENDIX B: List of Research Projects Supported *en toto* or In Part by Joint Project Grants-in-Aid.*

1. Survey of Arithmetic Achievement in Alberta.
2. Calgary Bussing Project.
3. Adult Attitudes Toward Education in Alberta.
4. Survey of Financial Assistance for Graduate Study in Education.
5. Edmonton Grade III Achievement Study.
6. Improvement of Freshman English.
7. Five School Study.
8. School and Religion Study.
9. Special Project file (5 Minor Projects in Testing).
10. Canadian Language Usage Study.
11. Matriculation Articulation Study.
12. Clover Bar Survey.
13. Spelling Study.

*This list is given in terms of the *Short Title* used to identify Project for AACER Accounting. Many of these projects have been already reported in detail in *The Alberta Journal of Educational Research*. The list does not include research theses conducted by Project Research Fellows nor other graduate theses emerging directly from the projects noted above.

14. Adolescent Attitudes Study.
15. Edmonton Grade VI Study.
16. Freshman Leisure-Work-Study Time Survey.
17. Leisure Time Reading of the Jr. and Sr. High School Students.
18. Leader Behavior in Educational Personnel.
19. Follow-up Study of Certificated Teachers After Five Years.
20. Group Structure Influence on Student Honesty.
21. Relationship of Speed and Fluctuation on Test Scores.
22. Relation of Speed and Fluctuation on Creativity.
23. Cuisenaire Rod Mathematics Study.
24. Study of Design and Texture Preferences.
25. Study of Mathematical Competencies of Elementary Teachers.
26. Social Stratification of Alberta Freshmen.
27. Childrens' Concepts.
28. Development of a Canadian Reading Readiness Test.
29. Intellectual Ability and Sociometric Status.
30. Non-Academic Differences between Degree and One Year Program Education Freshmen.
31. Study of Errors.
32. Analysis of Alberta W.I.S.C. Scores.
33. Follow-up Study of Non-Academic Differences between Alberta Freshmen.
34. Calgary Streaming Study.
35. Academic Gains among Failing Students.
36. Teacher Judgments about Teacher Education.
37. Studies of Motor-Cognitive Functions.
38. Adolescent Inventory Analysis.
39. Comparison of the Achievement of Alberta and New Zealand Grade VI Students.
40. A Study of Stereotypes in Grade IX.
41. Edmonton Streaming Study.
42. Cognitive Aspects of Teacher Selection.

Appendix C: Recommendations and Comments of the *Alberta Royal Commission on Education* with regard to Research in Education (pp. 418-425).

Chapter 32

RESEARCH IN EDUCATION

It is an accepted fact of present day society that much of the credit for the rapid improvement in our standards of living, our technological development and the utilization of our resources is directly attributable to the fact that large sums of money and the country's best brain-power have been combined to conduct basic and applied research in industry and business. It is therefore not surprising that a substantial number of briefs submitted to the Commission by responsible groups strongly urged the importance of providing adequate resources for educational research. Indeed, the Commission was not long in discovering that time and again its own work was hampered by lack of information. In most instances the basic research on which to arrive at conclusions and formulate policy was lacking. In other instances the limited investigation that had been carried out was either too local or too old to be of much

value. Again, there were numerous instances where the raw data were available but had never been assembled and analysed so as to permit inferences and conclusions.

This lack of adequate research in the field of education is looked upon by the Commission as extremely serious. It is simply impossible to provide reasonably accurate hypotheses and conclusions on the myriad problems of education unless the necessary time, money and trained staff are made available. One of the Commission's first official acts was to set aside a sum of money for the purpose of carrying out a limited number of research projects without which no secure conclusions could be drawn, or recommendations made. Ten such projects, costing \$18,660.59 were initiated and carried out. The amount of information gained from the small investment has been of very great assistance to the Commission: its value serves to underline the importance of continuing provision for educational research as a necessary element in any effective program of education.

Business and industry spend hundreds of millions of dollars annually on research, and find it good business to do so. Government, and more particularly the public whose support is so vital, have been extremely slow to realize that an investment in educational research might pay returns far greater than a comparable amount spent in industry.

Developments

Educational research in Alberta has until very recently been almost entirely confined to post-graduate work at the University. Candidates produced theses to satisfy the requirements, first of the M.A. degree, and then of the present M.Ed. and Ph.D. degrees. Previous to the establishment of the Faculty of Education in 1945 and the formation of the Alberta Advisory Committee on Educational Research in 1953, research was limited by lack of funds, lack of facilities and lack of an adequate medium for the dissemination of research information. It is still woefully restricted, although some encouragement has been given since 1953.

The purpose of the Alberta Committee on Educational Research—representing the University, the Department of Education, the Alberta School Trustees' Association, the Alberta Teachers' Association, and the Alberta Federation of Home and School Associations—was to initiate, promote, finance and publish educational research in Alberta. As a means of disseminating research information it established the *Alberta Journal of Educational Research* in 1955, which until 1958 was the only educational research journal published in Canada.

RECOMMENDATIONS:

275. That immediate plans be made by the provincial government and the University to provide the space and equipment for the educational research organization described above at an initial cost of \$200,000.
276. That provision be made in the annual university budget for the staff establishment prescribed, at an annual initial net cost of \$100,000.
277. That the provincial government make provisions for the necessary capital and operating grants on a basis similar to that now used for the Alberta Research Council, at the earliest possible date.
278. That the University prepare a program of research projects to be completed in the next five years, and conduct a campaign to secure finances in whole or in part from outside sources—individuals, business, industry and foundations.
279. That the Province provide the legislative authority to constitute on a formal basis a revised and re-constituted Alberta Committee on Educational Research.

Since its establishment in 1954, the Alberta Committee on Educational Research has been able to secure limited funds from its member associations, from business and industry, and from some of the large foundations. Already it has made a small but significant contribution to knowledge on Canadian education. In 1959 the first of a series of Alberta monographs, scholarly studies on educational problems of major importance, has been published. To supplement this work at the layman's level the Alberta Newsletter on Educational Research has been established.

During the past four years a number of other significant moves in the direction of more educational research have been taken. The Department of Education has established the position of Coordinator of Tests and Measurements, the Edmonton Public School Board has created a position of Director of Research and Personnel, a group of principals and superintendents in the Red Deer zone have established the research-oriented Five Schools Project, and a joint committee of the University and the Department of Education have established the Matriculation Study Subcommittee. The contributions of the Carnegie Corporation of New York, the W. K. Kellogg Foundation of Battle Creek, Michigan, and the support of local individuals and agencies has enabled the establishment in the University of an initial plan of organization and the carrying out of further valuable projects. These developments represent a sound

beginning in the systematic and scholarly attack on fundamental problems of education.

Needs

In a special memorandum prepared at the request of the Commission, the Faculty of Education at the University of Alberta has stated the specific needs for educational research as follows:

1. Research designed to study the general problems of society, of which education is one. Such research, because of its sociological and economic aspects, should be planned and executed by trained research workers in sociology, economics, or education, or by teams of workers from these fields.
2. Research designed to study educational problems of particular interest to responsible groups of citizens or responsible institutions. Such research studies might be undertaken (for the Canadian Education Association, Canadian Teachers' Federation, Canadian School Trustees' Association, and others) on an *ad hoc* basis, and would be under the direction of well-trained research staff. Alternatively, studies might be conducted by a permanent educational research organization developed along the lines of the Alberta Research Council, or as special projects with special staff working with a Director of Educational Research and the Faculty of Educational Research Committee, using the appropriate facilities of the University.
3. Research designed to study problems in education at both the theoretical and practical level. Such research should be centred in the Faculty of Education where it can be sponsored, planned, and conducted by trained staff, either as part of their own studies or those of graduate students. Facilities for such research should be an integral part of the resources of the Faculty of Education. The Director of Educational Research and the Faculty of Education Research Committee should provide stimulus, guidance, liaison and assistance to carry through research projects.
4. Research designed to accumulate facts about schools, pupils, teachers, examination results and related problems, or to answer specific questions of direct interest to the Department of Education. This type of research should be done by the Department of Education, and the department should make available the necessary staff and facilities.

Organization

In the carrying out of the four types of research outlined above, two main existing agencies are involved: the Department of Education and the Faculty of Education. Other faculties will or should be involved, and in this sense the second major agency should be the University inclusive of all faculties rather than just the Faculty of Education. As part of its overall plan the Commission has proposed the establishment of a third agency, the Alberta Educational Planning Commission, which will have an important and direct relationship to the original agencies in determining, initiating and making provision for educational research.

The Department of Education

In its normal administrative routine the Department receives a continuous flow of reports and statistical data which should be

analysed and consolidated in such a manner as to show significant interpretations and relationships, while at the same time organizing the original data as a basis for further study as required.

RECOMMENDATIONS:

274. That the Department of Education establish as soon as possible an office of standards, statistics and information.

The University

At the University, while it is recognized that the Faculty of Education should continue to give educational leadership, other faculties such as those of Arts and Science, Agriculture, and some others, have interests which may have a direct or parallel bearing on various problems of public education and which should be represented on the University section of the A.C.E.R. Individuals, groups of individuals consisting of professors, graduate students and other qualified people should work under the direction of the appropriate faculty committee and under the overall guidance of the Director of Educational Research.

Research projects would normally come from interested individuals, divisions and departments of the University, and be approved by the appropriate faculty organization before going forward for final approval of the Alberta Committee on Educational Research. It would be expected that the University should at all times stress the value of an interdisciplinary approach where this is appropriate. Copies of all reports on research projects should be filed with the Alberta Educational Planning Commission as well as with the Committee. Research projects originating outside of the University should be submitted for approval directly to the Alberta Committee on Educational Research, which would then have the responsibility of assigning the project to the individual or group best qualified to carry it out. From this point on the project would be handled in the same way as one originating in the University.

In order to make an expanded program of educational research effective, provision should be made in both the Department of Education and in the University to provide a nucleus of staff and equipment and the necessary space in which to work. The office of standards, statistics and information and the Central Registry of Teachers should be under a director with the necessary staff and technical resources to carry out the tasks of collating, analysing and evaluating educational data, and of keeping an up-to-date registry of all teachers within the province.

Provision should be made at the University for a full-time Director of Educational Research, who will be attached to the

Faculty of Education. This officer should have with him a minimum core of highly qualified research personnel, with the additional provision that personnel for special projects could be seconded from other agencies, either public or private, for such times and such purposes as were approved by the Faculty and the Alberta Committee on Educational Research.

The minimum requirements for space, staff, equipment and money required to provide facilities for a modest program of educational research in the next ten years as envisaged by the Faculty of Education would be as follows:

1. *Space Requirements*

8,000 square feet to provide a machine room, research library, research storage room, two research workrooms and several offices.

2. *Equipment*

Minimum of 5 typewriters, 10 calculators, IBM equipment less electronic computer, office equipment, and provision for share of time on an electronic computer.

3. *Staff*

Director, research director, machine-room supervisor, 5 research assistants, 4 secretaries, plus provision for an estimated special projects staff which might average 10 persons.

4. *Estimated Capital Costs for Space and Equipment*

..... \$175,000 - \$200,000

5. *Annual Operating Costs, 1960*

a. Machine rentals:

IBM equipment and electronic computer \$ 30,000

b. Regular staff—12 people 60,000

c. Special project staff 50,000

d. Supplies and publications 10,000

e. Research library 1,000

\$151,000

It is possible that many special projects could or would be financed from sources other than governmental or university.

PROFILES OF SOME STEREOTYPES HELD BY NINTH-GRADE PUPILS

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Stereotyping, defined (8, p. 107) as "a tendency to attribute generalized and simplified characteristics to a group of people in the form of a verbal label," is probably one of the major correlates of tensions in intergroup relations. In recognition of this probability, the Third Session of the General Conference of UNESCO (1, p. 1) designated "the ideas which the people of one nation hold concerning their own and other nations," as one of the areas of "Tensions Affecting International Understanding." Young states (2, VII) that "the understanding of international tensions is beclouded with stereotyped thinking," and Klineberg submits (2, p. 124) that "our educational attack must be against all forms of stereotyped thinking." Granting the validity of these views, it would seem especially important for teachers, and others concerned with education, to have some knowledge of the stereotypes held by their pupils.

The Purpose of the Study

The purpose of this study is to provide information about the stereotypes of Canadians, French Canadians, Englishmen, Americans, Indians, and Russians, as they are perceived by ninth-grade Alberta pupils. It is felt that such information would be helpful to teachers in general, and especially those concerned with teaching against stereotyping and toward intergroup and international understanding.

The Instrument Used

As a measure of stereotyping, a test devised by Stautland (7) was used.* Constructed after the manner of Osgood's semantics differential (4), and as revised for this study,† the test places the respondent in the situation of judging various concepts: Canadians, French Canadians, Americans, Englishmen, Indians and Russians, in regard to pairs of polar terms: practical-impractical, kind-cruel, intelligent-dumb, superior-inferior, happy-sad, clean-dirty, brave-cowardly, peaceloving-warlike, honest-dishonest, hardworking-lazy. These polar terms were chosen from terms reported by UNESCO to be most often used by the peoples of the world to describe each other (2).

*Permission of the author was obtained both to use and revise the test.

†The only change made was to substitute the concepts Canadians, French Canadians, and Indians for the concepts Chinese, Mexicans, and Norwegians. Stautland had included Americans, Englishmen, and Russians in the original test.

The respondent judges the concepts in relation to a seven-point scale, where the directions are that marking the middle of the scale indicates the respondent thinks the concept is neutral in relation to the ends of the scale, and marking outward from the middle indicates the respondent thinks the concept has a progressively stronger relation to either end of the scale, as follows:

Concept (Canadian, French Canadian, etc.)							Polar Term (Cruel, etc.)
Polar Term (Kind, etc.)	(3)	(2)	(1)	(0)	(1)	(2)	

For testing purposes, the polar terms were arranged by random procedures, the arrangement being different for each concept. For purposes of statistical treatment, the scale was weighted from one to seven, starting with one at the positive side each time, the polar terms being arranged with the positive terms on the left, the negative on the right. This was done to make clear the position of each group concept on each positive-negative continuum.* Since there are 10 pairs of polar terms for each group concept, and since the smallest value possible for any pair is one, the lowest score obtainable for any group is 10, the highest 70. For the total test the range is from 60 to 420.

As evidence of the reliability of the test, Stautland presents test-retest total score reliabilities of over .90 for groups of high school pupils. As evidence of validity, Stautland obtained a validity coefficient of .39 with a test of stereotyping reported by Siegel (5). However, it is also evident that the test has a certain "face" validity, or logical validity, for with it we are able to ascertain the strength of a respondent's "tendency to attribute a verbal label to a group of people." We can also ascertain some specific characteristics of the verbal label.

The Sample

Two considerations provide the rationale for choosing the ninth-grade level for the investigation of stereotypes: (a) pupils are old enough at this level to have developed somewhat definite intense stereotypes, and (b) pupils at this level still have some years of schooling before them, so that such implications for curriculum change as information about pupil stereotyping behavior might provide may still be implemented.

In selecting a sample of ninth-grade pupils for the study, individuals were sought of approximately similar socio-economic

*This is equivalent to adding a constant of 4 to the original weights of 3210123. Such an addition does not change the shape of a distribution. It was made in this case simply for convenience and does not in any way alter the results of the study.

background, educational level and age. Accordingly, the stereotyping test was administered to five typical ninth-grade classes in a Calgary junior high school, comprising 70 boys and 62 girls chosen for their homogeneity in respect to the aforementioned variables.

Results

The stereotyping test was given to the sample on April 18, and, in order to obtain test-retest reliability coefficients, again on May 9, 1961. Table I shows the test-retest coefficients for the total test and for each group by boys, girls, and total sample. It is not surprising that these coefficients are rather low, given the age range of the sample, the brevity of the subscales, and the fact that, in testing for stereotypes, we are dealing with attitudes which are often none too stable. It will be noticed that in terms of absolute differences in reliability coefficients and except for the Indian group, it seems at first glance that girls might be more reliable in their stereotyping responses than boys. However, for each subscale a *t* value was calculated for the difference in reliability coefficients of boys and girls, using Fisher's *r* to *z* transformation (3, p. 147), and no difference in test-retest reliability coefficients for boys and girls was found to be statistically significant. Apparently the boys and girls did not differ in reliability of stereotyping responses.

TABLE I
TEST-RETEST RELIABILITY COEFFICIENTS FOR THE
STEREOTYPING TEST BY BOYS, GIRLS, TOTAL SAMPLE*

	Boys	Girls	Total Sample
Canadian	.49	.64	.56
French Canadian	.64	.65	.64
American	.47	.56	.52
English	.50	.58	.55
Indian	.53	.49	.52
Russian	.41	.53	.46
Total Test	.50	.70	.60

*1st Administration, April 18, 1961.

2nd Administration, May 9, 1961.

Still another question may be asked: Are there significant differences in reliability of response as between the six groups? We may answer this by again applying the *r* to *z* transformation. Since

there were no statistically significant differences between boys and girls, the technique was applied only to differences for the total sample. Of the possible fifteen significant differences in reliability coefficients, just one was statistically significant, that being the difference between French Canadians and Russians, which was significant at the 5% level of confidence. This is not a very meaningful finding, however, for one significant difference in fifteen possibilities may easily occur by chance. We must conclude that the sample did not show any particular tendency to vary in its reliability of response as between groups.

The means and standard deviations for the groups, by boys, girls, and total sample, are shown in Table II. These statistics were obtained by using the system previously described: the means for each group were derived by assigning values from one to seven along the continuums, starting with one at the positive side each time. Thus, the lower the mean, the more positive the stereotype. This procedure enables us to put the groups in a rank order. In terms of absolute scores for the total sample, and from the most positive stereotype to the most negative, the rank order is: Canadians, French Canadians, Americans, Englishmen, Indians and Russians. That is, Canadians are seen as being closest to the positive end of the scale, French Canadians next, and so on. In view of the proximity of Canadians, French Canadians, and Americans, and in view of Canada's historical ties with England, this ranking of stereotypes is what we might have reasonably expected, as are the more negative stereotypes held for Indians and Russians.

TABLE II
MEANS AND STANDARD DEVIATIONS FOR STEREOTYPING
TEST FOR BOYS, GIRLS, AND TOTAL SAMPLE*

	Boys M (N=70) SD		Girls M (N=62) SD		Total Sample M (N=132) SD	
Canadian	24.5	7.4	25.2	6.7	24.9	7.0
French Canadian	27.2	8.1	29.3	7.5	28.3	7.8
American	28.3	8.0	29.6	6.7	29.1	7.4
English	28.8	6.4	29.5	6.5	29.2	6.5
Indian	34.8	7.3	36.8	7.7	35.9	7.6
Russian	36.2	6.9	35.9	7.5	36.0	7.2
Total Test	180.3	30.0	186.8	29.6	183.9	30.0

*1st administration.

To examine for differences between groups, a Friedman two-way analysis of variance by ranks (6, p. 166) was run and the resulting X^2_r of 45.1 found to be significant at beyond the .001 level. From this, we may assume that there were significant differences between groups. To examine for specific differences, t tests were calculated for differences between means. Taking the 5% level of confidence as significant, there were no statistically significant differences for boys and girls for either mean or standard deviations for the groups, or for the total test. Because of this similarity of response of boys and girls, only the total sample means were used for t tests of the significance of differences as between groups. Table III summarizes the results of these tests.

TABLE III
SIGNIFICANCE OF MEAN DIFFERENCES BETWEEN
GROUPS FOR TOTAL SAMPLE*

	F. Can.	Amn.	Eng.	Ind.	Russ.
Canadian	0.5%	0.5%	0.5%	0.5%	0.5%
French Canadian		NSD	NSD	0.5%	0.5%
American			NSD	0.5%	0.5%
English				0.5%	0.5%
Indian					NSD

*1st administration.

Perhaps the most noticeable finding presented in Table III is that Canadians was the only group concept perceived significantly different from all other group concepts. The term Canadians was apparently seen as significantly more positive than any others. The Indian and Russian group concepts were apparently perceived as significantly less positive in comparison with the other groups, although there was not a significant difference in the two. French Canadians, Americans, and Englishmen were seen as somewhat similar, for the means of these groups do not differ significantly from one another, yet these group concepts are seen as different from the others.

Tables II and III suggest that the six groups are in three "clusters" along the positive-negative continuum: Canadians being seen most positively and as different from the other groups; French Canadians, Americans and Englishmen being seen next most positively and as like one another but different from the other groups;

and Indians and Russians being seen least positively and as like one another but different from the other groups.

TABLE IV
INTERCORRELATIONS FOR THE STEREOTYPING TEST
BY TOTAL SAMPLE*

	F. Can.	Amn.	Eng.	Ind.	Russ.
Canadian	.55	.62	.58	.31	.04
French Canadian		.45	.53	.43	.25
American			.53	.35	.07
English				.25	.24
Indian					.27

*1st administration.

The intercorrelations presented in Table IV lend general support to the observation of three “clusters” within the six stereotypes. The concept Canadians is most highly correlated with the cluster already observed to be most like it, the French Canadians, Americans, Englishmen stereotypes. It has its lowest correlations with Indians and Russians. The lowest correlation between any two groups is that between Russians and Canadians, as we might expect, since these stereotypes are the greatest distance apart on the continuum. However, the intercorrelations do not present a picture completely consistent with the previously presented findings. The discrepancies observed (e.g., that Indians and Russians are not very highly correlated, even though they occupy nearly the same position on the continuum) may be better understood through an examination of the specific profiles of the various groups. Figures 1, 2, and 3 present the profiles of the six groups by total sample, the profiles being obtained by taking the means for various pairs of polar terms and plotting them. It should be noted, again, that the arrangements of the polar terms in the Figures is only for convenience in presenting the profiles. On the test itself, the polar terms were arranged randomly, there being a different arrangement for each group concept.

The profiles are presented in the three figures so as to correspond with the clustering tendency already pointed out. Perhaps the first point of significance concerning the profiles has to do with the similarities and differences in their shapes. Even though the overall Canadians mean is significantly different from the overall means of

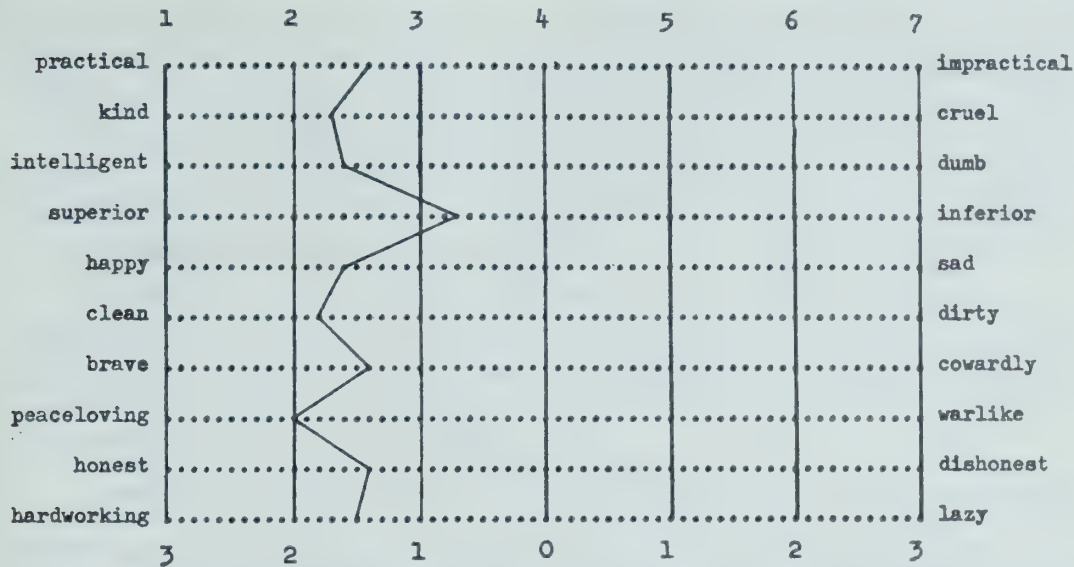


Figure 1. Profile for Canadians for the total sample of 132 boys and girls. This profile was derived by plotting the means of the categories for the first administration of the test.

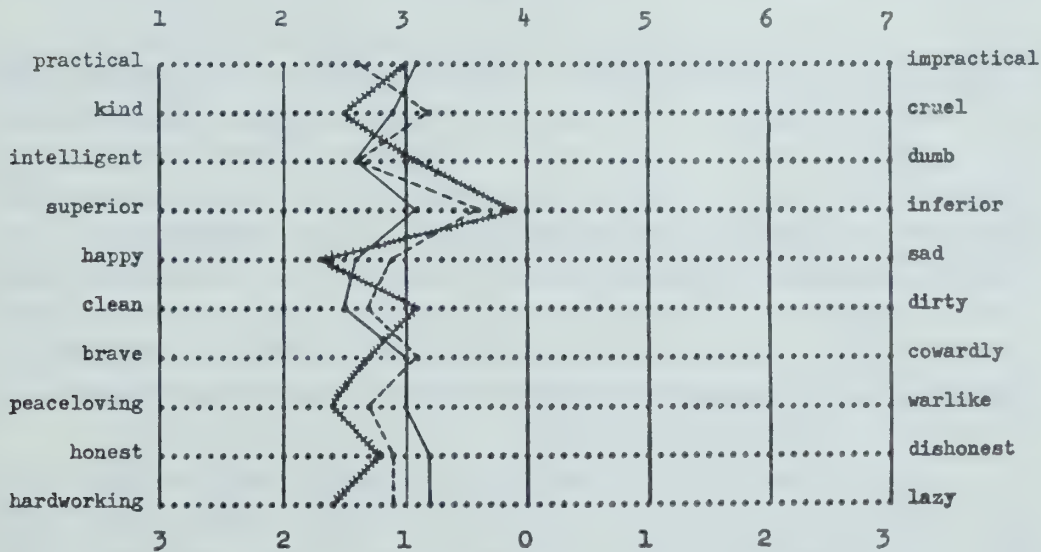


Figure 2. Profiles for French Canadians , Americans — and Englishmen ---- for the total sample of 132 boys and girls. These profiles were derived by plotting the means of the categories for the first administration of the test.

French Canadians, Americans and Englishmen, the shape of the Canadians profile is strikingly similar to the profiles of these groups. The similarity is particularly apparent as between Canadians, Americans, and Englishmen. Undoubtedly the most closely fitting profiles are those of the Americans and Englishmen. All four of these profiles have a sharp peak toward *inferior* on the superior-inferior category. At first, this makes little sense, considering that these groups are perceived as more intelligent, more kind, more practical, etc., than the other groups. Why then should there be such a peak

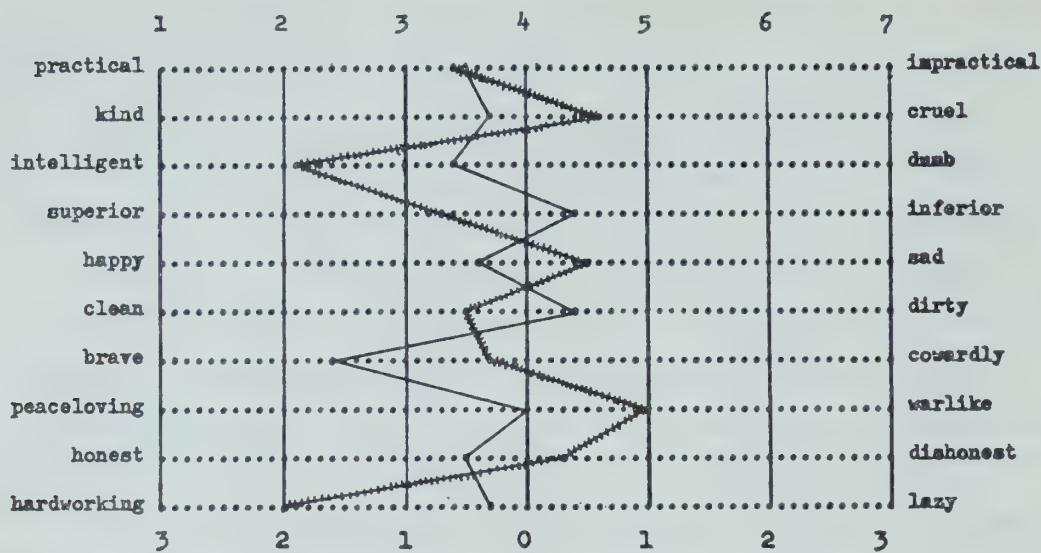


Figure 3. Profiles for Indians — and Russians for the total sample of 132 boys and girls. These profiles were derived by plotting the means of the categories for the first administration of the test.

on inferior? It appears that this can be explained if we think again of the directions under which the test is taken. It will be recalled that in marking the test the middle of the scale indicates neutrality. It seems reasonable to suppose that while respondents are willing to mark terms such as clean, dirty, sad, etc., which describe rather specific characteristics, toward the ends of the scales, they are less willing to make sweeping judgments of groups, such as their being superior or inferior. The peaks on inferior probably really indicate a neutral feeling. It may be that the superior-inferior category is a different kind of dimension from the other categories, and is measuring something different from them.

An examination of the Indians and Russians profiles shows that even though these groups have almost identical overall means they have very different profiles from each other and from the other groups. The most variable profile of all the groups is that of the Russians, while the Indains profile is next most variable. The high peaks of these profiles seem particularly significant. We note that the Russians are perceived as the most extremely intelligent, hard-working, warlike, and cruel of the groups. The Indians are seen as the bravest. Thus, despite the fact that the perceptions of Indians and Russians are generally less positive than the perceptions of the other groups, these groups still have some quite positive attributes. Even though these groups occupy nearly the same mean position on the scales, they are perceived by pupils as distinctly different groups.

There is another interpretation possible for the Indians and Russians profiles, however, other than that they are generally more

negative than the other four. The overall means for Indians and Russians are 35.9 and 36.0 respectively, which indicates, from the directions for taking the test, that these overall means are nearly at the neutral position of the scale. It would seem that, from one point of view, the subjects of the study were less willing to judge these groups as positive or negative, the exceptions being where we find high peaks on the profiles.

The boys and girls of the sample can be said, in one sense, not to have made up their minds about the Indians and Russians concepts, except that these concepts are definitely not seen in as positive a light as the other four.

Conclusions

The sample used in the study was composed of urban, middle class, ninth-grade pupils from a junior high school in Calgary, Alberta, and while this limits the generalizations we may make about pupil stereotyping behavior, as regards the population concerned, the following conclusions seem justified:—

1. There is probably no sex differential in relation to reliability of tendencies to stereotype: boys and girls at the age range of the ninth-grade appear to be equal in reliability over time and as between groups.
2. The stereotypes held by ninth-grade pupils in this study were rather unstable, indicating that they may fairly easily change or be changed. This seemed to hold true even for group concepts such as Canadians, where we might have expected a relatively stable stereotype.
3. There are probably no sex differences relative to the degree to which different groups are stereotyped.
4. Statistically significant differences were found between groups, but these differences tended to be in "clusters": Canadians had a mean stereotype score significantly more positive than any other group; French Canadians, Americans, and Englishmen were seen next most positively and more like each other than like other groups; and Indians and Russians were seen least positively and more like one another than like other groups. There were statistically significant differences between all of these "clusters".
5. Although different groups were perceived as having different stereotypes, there were some very regular similarities between stereotypes. It was found that the shapes of the profiles for the stereotypes of Canadians, Americans, and Englishmen matched closely. French Canadians, Indians and Russians had uniquely shaped profiles.

6. The study yielded one very positive finding. Even though the Indians and Russians concepts were seen as definitely less positive than the other concepts, they were not seen as extremely negative concepts. Actually, these concepts were rated as near the neutral position on the scales. This would seem to indicate that ninth-grade Alberta pupils do not feel negative toward any of the group concepts presented in the study. All of the stereotypes obtained are either neutral or positive.

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THE EFFECT OF FOREIGN LANGUAGE BACKGROUND ON INTELLIGENCE TEST PERFORMANCE

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The Problem

From the time of Binet until the 1930's most psychologists were content to measure intelligence primarily by means of verbal problems. The limitations of such an approach, however, soon became obvious. Jan Masaryk, who was to become the Secretary of Foreign Affairs for Czechoslovakia, is reported to have been classified during a childhood stay in the United States as a mental defective by a Binet test, presumably because of his lack of familiarity with the English language in which the test was administered (6). Conventional intelligence tests assume a certain facility with the English language and familiarity with an urban middle class culture, two conditions not always met in a bilingual community. If the means for assessing intelligent behavior are obstructed, the estimate of that intelligence is distorted.

The purpose of this study was to ascertain, for a sample of Edmonton Grade VII children, the effects of a foreign language background on intelligence test scores with a view to selecting economic measures of general intellectual ability which, first, provide a valid estimate of intellectual potential and second, provide minimal handicap to children with a foreign language background.

Review of Related Theory and Research

Bilingualism, the use of more than one language by an individual, has long been recognized as an important factor in measuring the intelligence of children with a foreign language background. Over one hundred studies have been conducted in attempts to define the precise nature of this influence on the measurement of intelligence. Arsenian (3) in a review of the literature was able to sum up the major findings in the area by saying,

This summary points to the conclusion that bilingualism neither retards nor accelerates mental development, and that language handicap is most likely the factor responsible for the discrepancy between the performance of bilingual and monoglot children on verbal tests of intelligence. (p.74)

One variable that is important in the measurement of intelligence of bilingual children is the nature of the test employed. Numerous investigators including Pintner (23), Darcy, (8), Jones (14), and Altus

(1) have found that bilingual children score significantly lower on conventional verbal intelligence tests than do unilingual children. However, the discrepancy between the mean scores of the two groups is minimized when a non-verbal test of intelligence is administered. Hence, the salient conclusion that the conventional test of intelligence is biased against children with a foreign language background. The weakness inherent in most of these studies is pointed out by Anastasi and Cordova (2) who suggest that verbal and non-verbal intelligence tests may measure different functions. Relevant to this problem is Cronbach's (6) discussion of types of intelligence tests, in which he classifies tests on a bipolar continuum, on the basis of function. At one extreme are those he labels as "cold-blooded" predictors of school success. Empirical studies suggest that achievement tests and achievement-oriented intelligence tests are usually the best predictors of academic success for the majority of pupils receiving the relatively "fixed" treatment of standard curricula and teaching methods (4), (9). At the other pole Cronbach describes tests that are designed to tap "potential" and hence are only remotely concerned with immediate and specific prediction. This type of test would attempt to minimize the influence of previous educational attainments and accentuate the underlying mental power or learning ability. Tests fitting this description are generally regarded as having a high factorial loading on the general intellectual ability factor with minimal loading on verbal, numerical and other group and specific factors (19), (10).

The fundamental assumption underlying the use of this second type of instrument is what Cronbach and Gleser (7) term, "adaptive treatment" which vaguely resembles "mental orthopedics". That is, it is assumed that if an individual with high potential but a limited educational background or a cultural handicap is given appropriate adaptive treatment, his verbal intelligence and his subsequent educational achievements could be raised significantly. Support for this assumption is given by Sanchez (24) who, by providing remedial instruction in the language arts, was able to raise the mean IQ of a group of second grade Spanish-speaking children from 72 to 100 over a two-year period. Under such adaptive programs, it is plausible that the test which estimates potential ability will have greater predictive power than the conventional intelligence test.

MacArthur (20) suggests that when the teaching situation can be considerably adapted and when the criterion to be predicted is remote and general, as for example, in the elementary school, tests indicative of general intellectual potential would appear to be more useful for selection, placement and guidance.

Another implicit variable that has complicated assessment of the intelligence of bilingual children has been pointed out by Soffietti (25), who concludes that the retardation ascribed to bilingualism is due rather to biculturalism. "It is a conflict between ways of life, beliefs, customs, value systems and not necessarily one between language systems". More recent studies (11), (17) have stated more precisely the nature of this relationship.

Closely related to this cultural factor is that of socio-economic status which Jones (15) has shown to account for most of the difference between Welsh bilingual and unilingual groups on non-verbal tests of intelligence.

Finally, studies by Lambert and his associates (16), (18) at McGill have cast some doubt on the adequacy of the conventional Bilingual Rating Scales. Two problems present themselves. First, differences in bilingualism perhaps involves more than a quantitative difference. On the basis of Osgood's mediation theory (22), they have gathered some evidence that there may be a qualitative difference between compound and coordinate bilinguals. This difference may be reflected in intelligence test scores. Secondly, the assumption that the degree of bilingualism corresponds to the degree of bilingual background can hardly be justified (12).

The present study was concerned with the effects of foreign language background (which was considered to be essentially a pragmatic combination of bilingualism and biculturalism) on various tests of intelligence with certain known characteristics, in an attempt to select valid measures of the intellectual potential of children with a foreign language background. The two major criteria for the selection of valid instruments were first, a large loading on the general intellectual ability factor *g* with minimal group and specific factor loadings, and second, a minimal degree of relationship between test scores and language background. The study also investigated test relationships with school achievement and with *varying degrees* of foreign language background.

Collection of Data

The Sample

The subjects for this study consisted of 432 Grade VII children drawn from three large Edmonton public schools selected to be typical of the Edmonton Grade VII population. Elley and MacArthur (10) have shown this sample to be representative of all Edmonton Grade VII children. On the basis of a Language-Background Questionnaire subjects were classified into four groups representing increasing degrees of foreign language background, and

matched on socio-economic status. N's for the groups were forty, thirty-five, thirty-three and twenty-two respectively.

Group I, the unilingual control, consisted of individuals who reported no language other than English used in the home. Group II reported a slight degree of use of a language other than English in the home; this group was excluded from most of the analyses on the basis that it was difficult to establish that it truly had a foreign language background at all.

Group III consisted of subjects with a moderate degree of familiarity with a foreign language. English was the major language used by this group but most of the subjects understood quite well and spoke part of the time a language other than English. Most of the subjects in this group were born in Canada and learned to speak English and another language concurrently during childhood. One-third of this group spoke Ukrainian or Polish and about one-quarter spoke German.

Group IV, the definitely bilingual group, consisted largely of subjects who, although they spoke English, had some other language as their primary language. Three-quarters of this group were classified as immigrants. One-half of the subjects in this group spoke German; the remainder spoke Ukrainian, Dutch, Yiddish or Norwegian.

Table I shows that Group I, III and IV were not significantly

TABLE I
SIGNIFICANCE OF DIFFERENCES ON FOUR VARIABLES
FOR THREE MATCHED GROUPS

		Group I Uniling.	Group III	Group IV Biling.	Obtained F or t	Level of Sign.
N		40	33	22		
Lang.-Back		0	2	3	F = 20.17	.01
Soc.-Ec. Status	Mean	47.20	47.47	45.64	F = 1.35	N.S.
	S.D.	4.93	5.53	5.79	1.09 < F < 1.38*	N.S.
Sex	Male	18	12	10		
	Fem.	22	21	12		
	% Male	46	36	45	.08 < t < .83*	N.S.
Age	Mean	13-0	13-3	13-7	F = 3.00	.05

*More than one test was required, hence maximum and minimum values of F or t are recorded.

different on socio-economic status or sex; they were significantly different on Language Background scores and age.

The Tests

Tests used in this study were administered by Elley and included the Raven's Standard Progressive Matrices, Cattell Test of "g" Scale 2, Lorge-Thorndike Non-Verbal Intelligence Test Level 4, Holzinger-Crowder Uni-Factor Tests, California Short Form Test of Mental Maturity—Elementary, and the Laycock Mental Ability Test; these are all generally acceptable, reliable "intelligence" tests. Socio-economic status was measured by the Blishen Index (5) and a Home Index Questionnaire.

A Language Background Questionnaire similar to Hoffman's (13) was devised for the purpose of this study. Since the units of the questionnaire were not truly interval in nature the scores were grouped into four crude categories. Evidence of the validity of the questionnaire was obtained by correlating the results of the questionnaire with a similar independent item from Elley's Home Index Questionnaire; this procedure produced a Pearson coefficient of .79. The retest reliability for sixty-four of these same subjects was found to be .98.

Analysis of Results

1. (a) The extent to which the various tests met the first criterion of high *g* loading with low group and specific factor loadings had been previously examined through factor analysis. For a group of 271 of these same children representative of the Grade VII pupils of Edmonton Public schools, Elley (9) used the results from 21 tests in a principle components factor analysis. The loadings for sixteen of these tests on three major factors are presented in Table II.

An examination of columns 2 to 4 of this table shows that the tests most highly loaded with *g* and having negligible loadings on other factors are the Raven Matrices, Cattell Test of *g*, and the Figure Analogies subtest of the Lorge-Thorndike. These tests measure general intellectual ability apart from verbal, numerical or other educational skills. Such conventional measures as the CTMM Language and the Laycock have high *v:ed* (verbal:educational) loadings and, therefore, demand familiarity with the English language. The remaining tests, including the CTMM Numerical, and the Series tests from the Lorge-Thorndike and Holzinger Crowder, have significant loadings on the number factor and smaller loading on *g*.

(b) Agreement with the second major criterion, independence of language background, was studied by comparison of test means for the unilingual Group I and the bilingual Group IV matched on

TABLE II
SUMMARY OF FINDINGS FOR SIXTEEN INTELLIGENCE
TESTS MEASURED AGAINST SIX CRITERIA

(1) Test	(2) g Loadings	(3) v:ed Loadings	(4) n Loadings	(5) rp-bis with L-B	(6) Median r with School Mks.	(7) Mean r with Cal. Ach.
Raven Matrices	.78	.....	.....	-.02	.56	.41†
Cattell g	.79	.....	.....	+.04	.34	.35†
L-Thorn. Fig. Anal.	.74	.....	.....	+.15	.42	.39†
L-Thorn. Fig. Class.	.58	.....	.....	+.05	.31	.31
L-Thorn. Series	.55	.....	.40	-.10	.45	.41
L-Thorn. Total	.75	.....	.33	+.07	.43	.47†
Holz.-Crow. Spatial	.40	.....	.....	+.13	.....	.....
Holz.-Crow. Series	.46	.21	.45	-.14	.51	.49
Holz.-Crow. Fig. Cl.	.52	.....	.21	-.20	.40	.39
CTMM Spatial	.61	.....	.....	-.03	.....	.....
CTMM Logical	.66	.....	.....	+.34†	.....	.....
CTMM Numerical	.64	.20	.33	-.19	.....	.....
CTMM Verbal	.46	.66	.....	+.26*	.....	.....
CTMM Lang. Total	.58	.62	.....	+.26*	.67	.66
CTMM Non-Lang. Total ..	.62	.....	.35	-.07	.38	.38
CTMM Total .....	.....	.....	.....	+.16	.66	.65
Laycock	.63	.57	.....	+.33*	.59	.64

*Correlations with Language Background significant at .05 level.
†Correlations with Language Background significant at .01 level.
‡Tests with highest value as measures of general intellectual ability for bilingual children.

socio-economic status, and by point-biserial correlation of language background with the various tests of intelligence for these two groups. Since the two approaches provided redundant information, only the point-biserial correlations of language background with each intelligence test appear in Table II. (Data from the difference of means approach are presented graphically in Figures 1 and 2). Examination of column 5 of Table II shows that certain of the non-verbal tests including the Raven Matrices, Cattell Test of g, Lorge-Thorndike Figure Classification and the CTMM Spatial were found to be independent of the language background of bilingual children.

Conventional verbal intelligence tests including the CTMM Language and the Laycock showed a significant correlation with language background; foreign language background was related to lower verbal test scores. Non-verbal tests highly loaded with the number factor were negatively correlated though not significantly

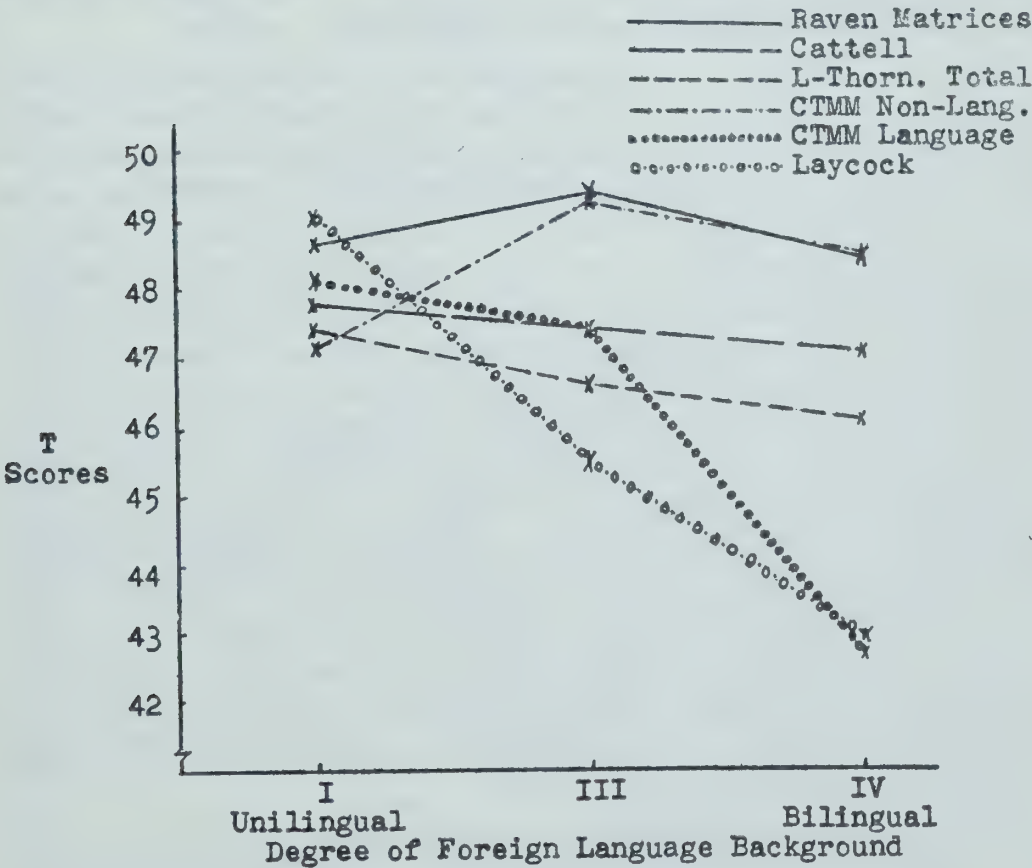


Figure 1
Relationship Between Degree of Foreign Language Background and Mean T-Score on Six Representative Intelligence Tests

with foreign language background; foreign language background was related to higher test scores.¹

(c) Other criteria of lesser significance used in the selection of instruments for the valid intellectual assessment of children of foreign language background included correlation of test scores with achievement scores (see Table II, columns 6 and 7), changes in IQ over a four year period, and a consideration of face validity.

2. In an attempt to examine more closely the nature of the relationship between *degree* of foreign language background and various intelligence test scores, T-scores, based on the entire Grade VII sample, for each of six intelligence tests were plotted for each of Groups I, III and IV. Figure 1 depicts the relationship between degree of foreign language background and mean T-score on selected intelligence tests.

An inspection of this graph shows that the general trend found in other studies is maintained here. Edmonton Grade VII bilinguals scored significantly lower than unilinguals on verbal tests while on non-verbal tests no differences were significant.

This comparison is limited by the fact that the groups do not have equal mean ages, the unilingual group being seven months younger than the bilingual with the middle group in between. A crude attempt to take this age differential into account was made by converting the mean raw score on each test to a mean IQ for each group by using the mean C.A. and the publishers' norms. Since the IQ's are based on publishers' norms they are not strictly comparable, only trends are dependable. By combining the two estimates of verbal IQ and the four estimates of non-verbal IQ a more stable comparison was facilitated. Moreover, the effect of increasing degrees of foreign language background on intelligence test scores becomes clearer by including Group II which has a slight degree of foreign language background. Figure 2 shows the relationship between degree of foreign language background and performance on verbal and non-verbal tests in general.

From an examination of Figure 2 it may be tentatively concluded that intelligence as measured by verbal tests is a curvilinear function of the degree of foreign language background and not a linear one as suggested earlier.

The effects of compound versus coordinate bilingualism proved to be untestable for this sample since the compound versus coordinate dichotomy coincided with that provided by the classification of immigrant versus non-immigrant, which in turn coincided with the

¹This unusual finding was attributed to the fact that the bilingual group was seven months older on the average than the unilingual group and hence had had more school experience with the almost universal Arabic number system.

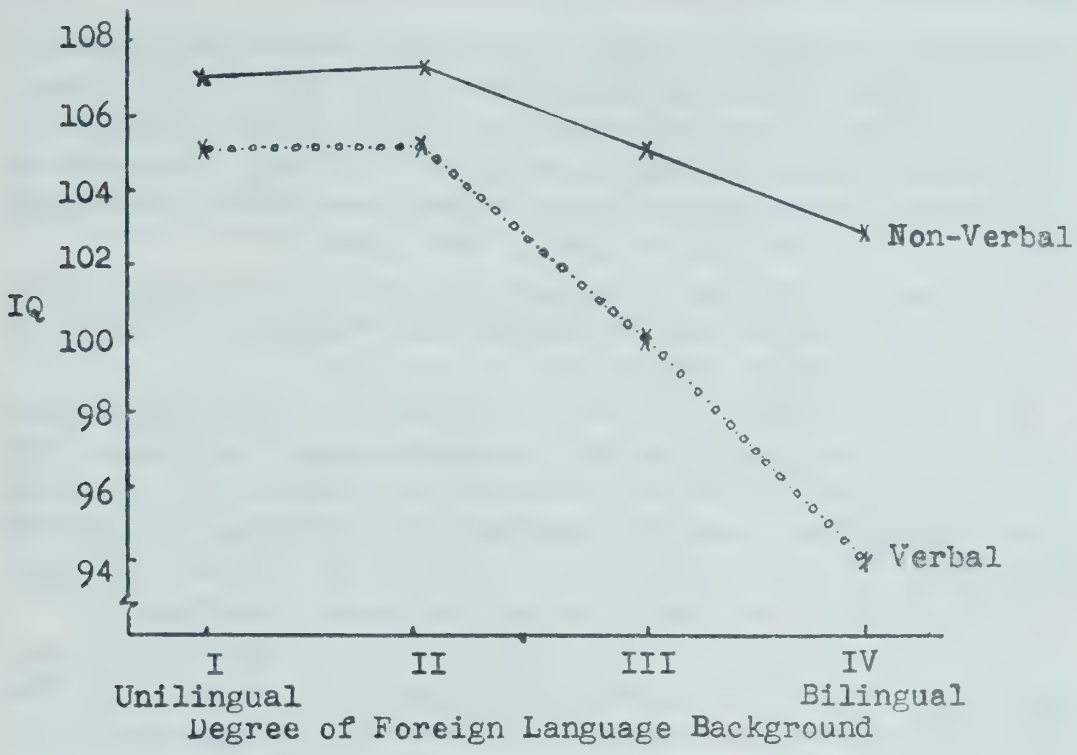


Figure 2

Relationship Between Four Categories of Increasing Degree of Foreign Language Background and Mean IQ on Verbal and Non-Verbal Tests

classification provided by scores on the Language Background Questionnaire.

Conclusions and Implications

In this study four groups having progressively increasing foreign language background, and all matched on socio-economic status and sex, were drawn from a larger sample representative of Edmonton Grade VII pupils. Performance of these groups on selected intelligence tests was examined with a view to selecting measures likely to be most useful in assessing the intellectual potential of pupils with a foreign language background.

1. The Standard Progressive Matrices, the Cattell Test of g, and the Lorge-Thorndike Figure Classification, in that order, best met the criteria of (a) high loading on a general intellectual ability factor, with negligible group factor loadings, (b) no significant relationship with foreign language background, and (c) moderate relationship with school achievement. The Matrices Test also met the criteria of face validity and relative stability for bilingual children over the period Grade III to Grade VII.
2. Even with socio-economic status held constant, the conventional verbal intelligence tests studied handicapped the pupils of

considerable foreign language background. For pupils with a moderate foreign language background, those who use a language other than English less than one-half of the time, conventional verbal intelligence tests presented no significant handicap. The relationship between scores on such tests and degree of foreign language background was curvilinear, rather than linear.

3. In general, this study supports the position that *g* is a useful construct and that it can be assessed relatively independently of verbal or other cultural factors.

4. It would appear profitable to employ one of the three tests validated in this study for the classification and grouping of bilingual children. Moreover, selection of children for intensive adaptive treatment could be based to some extent on results from these tests. Finally, experiments requiring an estimate of intellectual potential should make use of these non-verbal tests.

Further evidence now needs to be gathered regarding the empirical and practical usefulness of measures of the construct *g*. One of the main assumptions underlying the validity of this construct is the possibility of adaptive treatment and its relationship to general intellectual potential. What adaptive treatment beyond that now given in the schools is feasible? Is adaptive treatment more effective for children of high or of low intellectual potential? Do measures of intellectual potential have superior predictive power if used prior to adaptive treatment? The answer to these questions may well determine the approach adopted towards intellectual assessment, and the use of test results, in the future.

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A BASIC COMPUTER PROGRAM LIBRARY FOR FACTOR ANALYTIC STUDIES

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With the establishment of computing centers by many universities, an increasingly greater number of social scientists are considering more refined experimental designs solvable only with the aid of high-speed computers. The initial perplexing problem is one of determining what programs should be written first. This paper will consider two facets of the problem: (a) what are the minimum essential programs needed, and (b) what characteristics should the programs embody for maximum flexibility?

Although the author does not wish to enter a full length discussion concerning the various types of computers, it is essential that the reader have some familiarity with the manner in which the typical computer operates. The reader unfamiliar with the general operation of computers might refer to Berkeley and Wainwright(1) or Chaplin(6) for this information.

Any digital computer may in its simplest form be considered conceptually as a combination of four units: input, accumulator, memory, and output. The input section of the computer is that device which reads the data from either punched paper tape, cards, or magnetic tape. Generally speaking, the modes of output are identical to that of input. Most computers that are available to the social scientist require that the data be punched either on paper tape or on cards. There are distinct advantages to both systems of entering data, but the advantages and disadvantages must be weighed in terms of the computer and auxiliary equipment available. Punched paper tape does not usually lend itself to the addition or to the removal of data without complete re-perforation. It is however easy to store and handle, and affords few problems of jamming when being read by the computer input mechanism. Punched cards on the other hand, while perhaps more susceptible to mechanical input problems, lend themselves to removal and addition of data very readily. Punched cards containing data facilitate such analyses which involve partitioning the information. Although most computers today input and output data via paper tape more slowly than when using punched cards, current developments indicate that tape may be faster in the future. Social scientists should seriously consider the nature of their problems and make representation to those concerned before purchase of computing equipment is to be made.

Frequently desk computers can also output information directly via a typewriter. The latter is not particularly suitable since the only record of the output is in a form not compatible with methods of inputting this information for future processing. It is therefore preferable to have information output via a more permanent record such as paper tape or punched cards.

Although the exact needs of the social scientist will vary with the particular types of problems of interest, the author's experience with Illiac¹ has shown that the following programs should be written during the initial phase in the development of the basic library.

1. Correlation coefficients, including regression coefficients, covariances, means, and standard deviations.
2. Matrix algebra operations such as addition, subtraction, multiplication, transposition, inversion, and latent root and vectors.
3. Factor analysis operations such as the diagonal, centroid, and principal components methods of factoring, and linear transformation (rotation).

The correlation program should be a product moment correlation, in order that a Gramian matrix be obtained—a necessary condition for certain matrix problems. The maximum number of variables that the program should handle is in the order of 70, and the maximum number of observations about one thousand, although this will vary with individual requirements. Data should be input in such a way that all variables for one subject are read in together and that the computation of sums, sums of squares and cross products follows. The same sequence of operations is observed for the next set of observations. In this manner, maximum use is made of computer memory space. The data should be output in such form that the tape or cards can be used for input again for further analysis, e.g., inversion or factor analyses. Indicating the output format necessitates the use of certain parameters which are given to the computer for suppression of specific computations. This is very important if the output is via paper tape. If the correlation coefficients are intermingled with regression coefficients on the tape output (as would be the case if both coefficients appeared in columnar form side by side) use of this tape for input becomes burdensome. In this case, suppression of the regression weights, or a printout at the end of the tape, is most useful.

The problem of having the program perform simple data checking steps should be seriously considered. The correlation program should check to determine whether the correct number of variables has been input for each subject. This may be accomplished by

¹The University of Illinois Digital Computer.

having this information precede the observations. Suitable program stops should be included in order that the operator can immediately determine the cause of any error—in addition to being able to correct the error and continue computation. If for some reason a correction cannot be made immediately, the operator of the computer should have the option of extracting all the computed sums of squares, cross products, and sums so that this information can be read in later when the correction has been made, thus saving considerable computer time.

In summary, the correlation program should be a product moment correlation in which the covariances, correlations, means and standard deviations can be output. The calculations output and their format, i.e., square, upper or lower triangular, should be determined by the initial parameters input. Suppression of certain computations may be necessary to facilitate data input for the next analysis. The correlation program should also provide a number of checks upon the data. The usual checks are for incomplete data, zero variance, and scaling errors. When any error occurs information indicating the nature of the error should be output. Provisions should also be made for removing from the computer the sums, sums of squares, and cross-products if any error does occur. It should be possible, after correction of any error, to have the computer begin computation where it left off. Finally, the correlation program should output unities in the diagonal elements.

Matrix algebra programs are indispensable to the social scientist primarily because many statistical and data analysis problems can be most readily interpreted and handled in this short-hand notation. Such problems as multiple regression, discriminant function analysis, and analysis of variance can be handled with greater ease using this system (7). In addition to a matrix inversion program, matrix addition, subtraction, and multiplication programs are required. The addition and subtraction programs are quite straight forward and usually involve no problems except perhaps ones of scaling. The error checks suggested here would be those of conformability for the arithmetic operation involved. To save space in the computer memory, only the one matrix need be held at any one time—the addition or subtraction proceeding as each row or column is read from tape or card. In the case of the matrix multiplication program a row by column multiplication is required. As with the addition and subtraction program the computer should check for conformability of the matrices and that each row or column contains the same number of elements. Most cases of overflow can be caught by checking the sign of the product after a multiplication. If overflow does occur provisions for automatic rescaling are very

useful. The number of decimals in the output is a useful variant which may be introduced by a parameter preceding the first set of data. In addition, provisions should be made for retaining the product matrix within the computer memory for further calculations, e.g., to form the matrix product ABC .

Another useful matrix operation is that of obtaining the transpose of a matrix. This step is necessary if one desires to form the matrix AA' , which will contain the sums of squares in the diagonals and the sums of cross products in and off diagonal positions.

Mathematically, the calculations of an inverse of a matrix is of fundamental importance and no computing center can operate without such a program. As with the other programs, provisions for specifying the number of decimal places in the output, and the format (by rows or by columns) of the output should be possible. In addition the program might incorporate provisions to find AA^{-1} if a check is desired on the adequacy of A^{-1} . There are a number of different ways an inverse might be computed: (a) by Gaussian elimination, (b) by reduction to zero of the rows and columns (with the exception of the diagonal elements which are to be unity) and a similar operation upon an identity matrix, and (c) through the diagonal method of factor analysis(8). The latter method is suggested if the programmer is not experienced. In most instances the computer company can supply an inversion program. The only problem which may be encountered is that a matrix (say of correlations) may not be in a form compatible with the input of the inversion routine in terms of format and scaling.

A very useful program involving matrix algebra requires the solution of the characteristic equation $(A - \lambda I)x = 0$. This problem is also referred to as one of finding the eigenvectors and eigenvalues, the latent vectors and latent roots, or the characteristic vectors and roots of a symmetric matrix. The latent root and vector problem is one that arises not only in problems of analysis of variance(11), but also in discriminant function analysis(7), analysis of learning curves(22), and in factor analysis (10,21). In the latter instance the principal components are within a scaling factor of the latent vector, $\lambda_{\frac{1}{2}}$ if the latent vectors are normalized. Thus a principal components factor analysis can be effected with such a program. The program is also necessary when one matrix is being approximated in the least squares sense by that of another matrix of lower rank(9). It is suggested that a program such as this be acquired from the firm from which the computer has been purchased. If however one does want to program such a problem, Bodewig(2) or Harmon(10) are excellent sources for determining which procedures might best be used.

With the access of computers to many social scientists problems of factor analysis involving a relatively large number of variables becomes possible. It is suggested that three programs be considered for factoring a correlation matrix: (a) the diagonal or square root method; (b) the centroid method, and (c) the principal components method. It is suggested that either the centroid or the principal components method be developed first. The principal components solution is most preferable because the maximum amount of variance is extracted with each factor. The centroid method, although basically very easy, presents problems of reflection. The centroid program should be written to accept the output from the correlation program. Options should be made available for the user to introduce communalities other than unities provided by the correlation program, specify the number of digits in the output, indicate the number of factors to extract, print out a record of the variance accounted for by each factor extracted, and to output the residual matrix. The latter case also implies that if further factors are to be extracted a record of the reflection process must also be output. Provisions should then be made to re-enter the residual matrix and the record of reflections in order to continue extraction of factors. Care should be taken to ensure that the output from this routine is compatible with any program for analytical transformation (rotation).

If at all possible a principal components solution should be used (15). Two methods might be considered, the first based upon a sine-cosine transformation outputting the latent vectors and roots, or the principal component factors directly, and the second based upon Hotelling's iterative method. If the former is contemplated, an existing latent root and vector program might be modified, or one be written according to the flow diagram provided by Harmon (10). A number of distinct advantages exist for both types of solutions. Hotelling's method is easier to program and provides the first few vectors quickly. However, the rate of convergence becomes quite slow when the ratio of successive latent roots approaches unity. In this method therefore, the time can not be accurately specified. One marked advantage of Hotelling's method rests in the fact that it outputs the vectors in order of size in contrast to obtaining all the roots and vectors simultaneously as in the sine - cosine or Jacobi method.

In programming the Hotelling method thought should be given to retaining only the upper or lower triangular form of the correlation matrix in the computer. This complicates the problem of generating the addresses of the elements but saves a considerable amount of memory space. Provision should also be made to enter com-

munalities in the diagonal elements. Thomson (20) provides a desk calculator plan for solution of this problem, but it should be modified for use in the computer. The author has found that normalization of the approximated vectors solves most of the scaling problems, and in addition provides an easy method for testing convergence. Testing for convergence may be made by finding the inner product of the two successive normalized trial vectors. This scalar will be the cosine of the angle between the two vectors in a two dimensional space. When the convergence is within some a priori tolerance, e.g., $\phi = 0.5$ degrees and cosine $\phi = 0.99996$, convergence can be said to have occurred. Since upon convergence the desired vector is normalized, λ must be found using $x'Ax$ before the desired principal components vector can be obtained. Because this method outputs the vectors in descending size, it is very easy to incorporate a criterion for terminating the factoring process. It has been suggested by Kaiser (15), and Michael and Hunka (17) that the factoring process stop when the latent root becomes smaller than unity—the maximum amount of variance which might be contributed by an individual test when unities are used as communalities. When the squared multiple correlation is used (Guttman's lower bound estimate to the communality) factoring could be stopped when the last calculated associated latent root is negative. These criteria are more difficult to use when all vectors are obtained simultaneously as is the case using many of the programs based upon the Jacobi method.² Output should be of such a form as to be compatible with any analytic transformation program. In addition the residuals should be output in a form acceptable by any other factor analysis program.

The selection of the transformation or rotation criterion is one that must be based upon the purposes of the investigator and of course, upon psychological meaningfulness. It is very difficult to state explicitly which criterion should be employed. Basically the criteria may be divided into two categories: (a) orthogonal transformations (reference system is orthogonal), or (b) oblique transformations (reference system is allowed to approach some a priori degree of obliqueness). Much discussion has resulted concerning the meaningfulness and applicability of linear transformations (4,5, 12,18,23). It is suggested that initially an orthogonal transformation be programmed for a first reason that this transformation can form a basis for further oblique rotations, and for a second and perhaps more important reason that it is very simple to programme.

²This problem could be overcome if in the initial phase of the latent root and latent vector program the λ 's were obtained first. The vectors corresponding to the r largest roots might then be selected.

The most useful orthogonal transformation from the point of view of ease of programming and psychological meaningfulness is Kaiser's Varimax criterion (12). This criterion maximizes the variance of the squared elements by columns after each test has been corrected for uniqueness. A comparison of this method with others on the PMA matrix of correlations has been provided (16). A flow-type description of this program has been prepared for the computer coder (14). It is strongly suggested that this analytic criterion be the initial orthogonal transformation program written.

The problem of oblique transformation can be considered as one for the experienced computer programmer. Solutions in this case are infinitely more difficult than those in the orthogonal case. Although there are a number of criteria which are zealously advocated by their proponents (3,4,5,13,19) the author's experience suggests that the Oblimax criterion (19) or the Kaiser-Dickman (13) be considered first. Comparison of these two with other criteria are well presented in Harmon (10). Since these programs are difficult to write they should be attempted only after a critical study of their limitations and biases.

Summary

In writing this paper the author has been prompted by numerous requests from researchers in education and psychology as to what programs should form a minimum computer library for much of their work. A number of programs have been suggested including a discussion of the desirable characteristics which each should incorporate. In general, care should be exercised so that the programs in the library be compatible with each other for purposes of sequential analyses of data. This includes considerations of input and output options in addition to the use of meaningful error stops.

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AN EXPERIMENTAL APPLICATION OF THE CONCEPTS OF IMAGE AND PLANS TO THE COUNSELING SETTING

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The concepts of Image and Plans as used by Miller, Galanter and Pribram(2) are an attempt to link the response with the stimulus. The reflex arc was rejected as the basic building block of behavior because of its failure to account for the intervening variables. Instead of the reflex arc, a new comprehensive explanation, involving Images and Plans was formulated, which would link behavior directly to the cognitive processes.

While previous cognitive theories had narrowed the gap between stimulus and response, a certain gap, which still needed to be considered, remained. In their quest for a new model, they turned to a computer analogy, coining the psychological terms of Image, Plans, and TOTE (Test, Operate, Test, Exit) which are analogous to memory, programs, and the test negative of the computer.

The Theory

According to the theory, the personality is composed of a dynamic, evaluative Image and nondynamic Plans. While Image and Plans are defined separately, they must be considered operationally interdependent rather than independent entities.

Plans. Miller, *et al.* (2), define a Plan as "any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed." It is used to designate any rough sketch of action, including not only the general outline but also the details. The molar units of behavior are called strategies while the molecular units are called tactics. The Plans are a hierarchical list of instructions which must be executed in a manner very similar to the verbal directions given during the acquisition of a new skill.

The Image. The Image is the individual's internal representation of his world, organized in a unique manner according to his values and experiences. The term Image is used to designate a private representation of himself and his world rather than mere imagery. The Image controls the execution of Plans by its numerous TOTE hierarchies which test the appropriateness of each phase of operation. The information and values of the Image serve as

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standards against which the Plans are measured. The information and values are incorporated into the Image by the execution of information processing and storing Plans. The storage and recall of information is facilitated by the use of verbal labels.

The TOTE. In order to facilitate the integration of Image and Plans, a TOTE (Test, Operate, Test, Exit) mechanism was also postulated by Miller, *et al.* (2). The TOTE may be considered to be analogous to a feedback without any connotation of reinforcement or values. It is merely a testing device whereby an act cannot be executed before it has been tested for relevance. It should be considered as a servomechanism, not only stopping behavior when certain conditions exist, but also initiating behavior when other conditions are present. Thus, these units would not be isolated but organized into a hierarchy, having relevance at both the strategy and tactic levels of behavior.

Problem and Hypothesis

Miller, *et al.* (2), report that the usual complaint of people seeking therapy is the inability to choose between incompatible Plans or that they are guided by irrelevant ones. This state of Planlessness or inadequate Plans is accompanied by emotions. The amount of emotion present seems to be directly related to the extent that their personal Plans are frustrated.

They further suggest that hypnosis may be induced by confusing the Planner and therefore the subject is willing to accept the Plans of the hypnotist. However, the failure of the Plans may also be due to defects in the Image. It may be that a Plan is infeasible not only because of Plan inadequacy but because of informational paucity in the Image. Likewise, if the Planner can be confused during hypnosis, may not also the testing phase in the Image be likewise confused? This reasoning can be further pursued by asking whether the Plans are inadequate because of a confused Planner or because of a disruption of the testing aspects of the Image? At present, the answers are not apparent. Therefore, in order to determine the efficacy of these concepts, attempts will be made to interfere with the Image and Plan separately and together.

Since according to the above discussion, prediction of results is not possible as to which measures will be affected by a specific treatment, the following exploratory hypothesis will be tested: Interference with the Plan, Image, and Plan and Image combined will result in different personality changes as measured by various personality tests.

Experimental Design

Subjects

The sixty-six subjects for the experiment were drawn from two introductory classes in Educational Psychology and randomly assigned to three experimental and one control groups. The sample consisted of 20 male and 46 female subjects ranging in age from 17 to 51 with a mean age of 21.3. On the ACE, the individual group means did not differ significantly. In keeping with the terminology of Miller, *et al.* (2) the experimental groups were designated Image, Plan and Plan-Image groups, indicating the treatment which was to be given.

Treatment

The treatment in each group had a special point of reference corresponding to the notions of Images and Plans. The topics or areas for discussion in the three groups were kept parallel as much as possible in order to minimize the effect of content. Various inter- and intra-personal problem situations, which were considered relevant to the majority of the subjects, were discussed. These topics centered around various familial, peer and school problems. Each topic was reworded to meet the requirements of each experimental group. The meaningfulness of the discussions was soon evident since many subjects had or were experiencing the stress at the time of the sessions. This helped to sustain interest and arouse active participation. The groups met weekly, except for practise teaching periods, for 15 weeks during the regular University year.

Image Group. The discussion focused on the Image, namely its values, concepts, and beliefs. An attempt was made to exclude any consideration of the individual's Plans. Each subject was continually directed to imagine that he was experiencing the stress and therefore was to try an evaluation of the experience as it appeared to him. He was then asked to describe or express his own Image with respect to his concept of personal worth, competence, acceptability, and integrity. Once the threatened self was verbalized, he was directed to change this evaluation of himself. An alternative self image, a miniature self image to be sure, was suggested by other members of the group. The various alternatives were not evaluated according to good or bad, nor to effectiveness or appropriateness in our society. The emphasis was not only on discovering alternatives which might be held under similar circumstances, but also on changing the self image. During the discussion, the experimenter helped make the present Image explicit and directed them in its change. Subjects were also encouraged to think differently about themselves during the other days of the week.

They were encouraged to verbalize their Image by recording it in a personal diary.

Plan Group. The focus of attention was the individual's Plans for meeting various life situations. Any direct or indirect consideration of the Image was carefully avoided. The subjects were first asked to make explicit Plans for meeting the stress situations which paralleled those described above. Secondly, the members were asked to create new Plans for meeting the same situation. No evaluation was placed upon these alternative Plans; they were merely to be different. Then as a group, new Plans for behavior were formulated and spelled out in detail. It was discovered that it was easier to speak in molar rather than in molecular terms. However, some proficiency in breaking the strategies into tactics was achieved. As in the Image group, the members were asked to record their own typical behavior and were encouraged to Plan and try new ways of meeting these situations during the week.

Plan-Image Group. As the name implies, a balance between Plan and Image treatment was attempted with this group.

Tests

The following tests were administered both before and after treatment. Where more than one score was obtainable from an instrument, the various scores will be indicated.

- (1) Rokeach's Dogmatism Scale (4)
- (2) Rokeach's Opinionation Scale (4)
Political left, right, and total opinionation scores.
- (3) Edwards' Social Desirability Scale (1)
- (4) Schaie's Test of Behavioral Rigidity (5)
Three Rigidity Factor Scores and Total Rigidity.
- (5) Butler-Haigh Q-Sort (3)
Self-Acceptance and Adjustment scores.

Analysis of Data and Results

Statistical Procedures

The differences between pretreatment and posttreatment scores for each individual were obtained for all the variables and a t test of the differences was computed for each group to discover if any changes within the groups had occurred. Analysis of Variance of the differences were also calculated to discover differences between groups. The Hartly F test for k samples was made to test the homogeneity of the variances. (6)

A rank order correlation was used to correlate the Self and Ideal Q-Sorts. The rank order correlations between the Q-Sorts were transformed to Fisher's z's for further treatment.

TABLE I
CHANGES IN MEANS, STANDARD DEVIATIONS OF
DIFFERENCES AND t's FOR FOUR GROUPS OF
ELEVEN VARIABLES

Group	Image n = 16			Plan n = 17			Plan-Image n = 16			Control n = 17		
Variable	$\bar{d}$	s	t	$\bar{d}$	s	t	$\bar{d}$	s	t	$\bar{d}$	s	t
DOGMATISM	-8.25	18.0	1.83	-1.90	20.8	.37	-3.80	23.1	.66	-4.60	14.6	1.30
OPINION T	-3.68	18.1	.82	-8.70	16.2	2.21*	-5.31	14.2	1.50	1.65	22.8	.30
OPINION L	1.20	13.0	.37	-2.20	12.2	.89	-2.10	5.9	1.42	5.40	15.1	1.46
OPINION R	-4.80	13.1	1.46	-6.50	9.60	2.79*	-3.10	10.3	1.20	-3.50	14.5	1.00
EDWDS SDS	.63	3.9	.66	—	.82	1.30	—	.56	.57	—	.24	.29
TBR MC	1.30	6.6	.78	2.10	7.0	1.23	4.75	10.7	1.77	4.00	8.3	1.99
TBR PP	-1.60	5.7	1.12	.50	6.0	.35	-2.10	3.6	2.35*	—	.20	.11
TBR PS	6.30	4.5	6.02†	5.90	4.4	5.51†	7.40	3.9	7.63†	3.94	5.1	3.18†
TBR COMP	2.10	3.1	2.73*	2.50	3.9	2.60*	3.30	4.5	2.95†	2.70	4.8	2.33*
ADJUSTMENT	2.50	5.9	1.70	4.20	7.40	2.35*	4.20	7.7	2.18*	1.40	6.5	.89
ACCEPTANCE	9.63	15.8	2.44*	20.41	22.3	3.79†	17.31	18.7	3.70†	4.76	14.8	1.33

*sig. @ .05
†sig. @ .01
‡sig @ .001

Changes within Groups

Using the difference method, the mean differences between pre- and posttreatment scores for each group were calculated. The mean differences, standard deviations of the differences, and the *t*'s for eleven variables are given in Table I.

For 15 degrees of freedom, the *t* had to be 2.13 and 2.95 to be significant at the .05 and .01 levels. No significant changes for any of the groups were found on the Dogmatism, Left Opinionation, Edward's Social Desirability, and Motor-Cognitive Rigidity Scales. Only the Plan group changed significantly on both Total and Right Opinionation. All the groups showed a considerable decline in Right opinionation with the Plan group change approaching significance at the .01 level.

Performance of all groups changed significantly on the TBR Composite score. The Image-Plan Group mean difference was significant at the .01 level and the other three at the .05. On the Psychomotor-Speed factor, the mean differences were significant well beyond the .001 level for all three experimental groups but only at the .01 level for the control.

On the Personality-Perceptual Rigidity factor, the Plan-Image group changed significantly in the direction of greater rigidity. However, the variance of this group was significantly less than the other three. The means of the Plan and control groups remained relatively stable while the Image group also tended toward greater rigidity. The unequal variances, however, make the results somewhat ambiguous and further comparisons hazardous.

Significant changes in self acceptance were found in the three therapy groups. The Plan and Plan-Image mean differences were significant well beyond the .01 level while the Image mean difference was significant at the .05. The subjects in the Plan and Plan-Image groups showed much more self acceptance after treatment than before.

The significant increase in the correlations between the Ideal and Self Q-Sorts which indicated greater self acceptance, could not be attributed to a lowering of the ideal concept. The Adjustment means increased for all four groups but only the Plan and Plan-Image groups changed significantly. While all groups changed toward better adjustment, the order followed the same pattern as that established on the Self Acceptance scores, the Plan group changing the most and the Control the least.

Differences between Groups

Except for the Psychomotor-Speed factor and the Self Acceptance scores, the *F* ratios were less than 2.00 and far from significant.

ance. The F of 2.72 for the Self Acceptance measure was just short of the 2.76 needed for significance. However, since the F was so near significance at the .05 level, the differences between means quite large, the F was treated as if significant. A difference of 12.36 between means was significant at the .05 level. Both the Plan and Plan-Image means differed significantly from the control mean. The difference between the Plan and Image means approached significance at the .05 level.

Discussion

Since the groups differed significantly only on one of the 12 measures, the general hypothesis that differential treatment would result in measurable differential results was not supported. Although the analysis of variance did not support the hypothesis, an examination of the various within-group changes indicated a possible trend. The Plan group changed significantly on six scales, the Plan-Image on *five*, the Image on three, and the control on two. However, it should be noted that all four groups changed significantly on two scales, namely the TBR Psychomotor-Speed factor and Composite score. In both cases, the control means changed the least. Any changes in the Image group were duplicated by both the Plan and the Plan-Image groups at either the same or even higher significance level.

One finding with special relevance to the Image-Plan paradigm is the change in means of the Plan and Image groups on the Dogmatism and Opinionation Scales. These changes are quite consistent with the theory.

Since beliefs are part of the Image, the Dogmatism Scale should be sensitive to changes in the Image. If the treatment was effective, the Image group would be expected to change the most. The mean difference of -8.25 was significant at the .10 level. The mean difference of the Plan group was not significant.

The Plan mean difference of -8.70 on the Opinionation Scale was significant at the .05 level. The mean difference of the Image group was not significant. This finding would suggest that the Opinionation Scale was more related to Plans. If intolerance is measured by the degree to which people are accepted or rejected because of their beliefs, the Opinionation Scale might be a measure not only of intolerance but also of the availability of Plans to meet people with different beliefs. However, since the differences between groups were not significant, the results only suggest an interesting possibility which should be investigated further.

Summary and Conclusions

Summary

1. By an analysis of variance of the differences, it was found that the groups differed only on the Self-Acceptance score. The Plan and Plan-Image groups differed from the control.

2. None of the within-group differences were significant on Dogmatism, Left Opinionation, TBR Motor-Cognitive Rigidity Factor, and Edwards' Social Desirability Scale.

3. All four groups changed significantly on the TBR Psychomotor-Speed Factor and Composite Score. The Plan-Image group changed the most on both measures and the control the least.

4. On the Self-Acceptance Scale, the Plan and Plan-Image groups changed significantly at the .01 level and the Image group at the .05.

5. Both the Plan and the Plan-Image groups changed significantly on the Adjustment Scale.

6. The Plan group changed significantly on Total and Right Opinionation.

7. The Plan-Image group changed toward greater rigidity on the TBR Personality-Perceptual Rigidity Factor.

Conclusions

Since the analysis of variance indicated a significant difference on only one of the 11 measures, no comprehensive conclusions may be drawn. The within-group changes, however, may suggest an interesting trend which deserves further investigation. The within group changes seem to suggest that:

1. the concepts of Plan and Image have some validity as they can be interfered with separately.

2. interference with Plans produces different changes than interference with the Image.

3. an increase in self acceptance is associated with better adjustment.

However, while the Plan group changes on more variables than the others, it cannot be assumed that this is necessarily a superior method.

Implications for further Study

1. The differential changes by the Plan and Image groups on the Dogmatism and Opinionation Scales need further study. This investigation would seek to determine the degree to which the Opinionation Scale is a measure of Plans rather than beliefs.

2. Since the subjects of the experiment were drawn from a normal population, and were not seeking counseling, it might be

profitable to utilize the concepts of Image and Plans in a clinical setting.

While the hypothesis was not supported, a definite trend favorable to the notions of Image and Plans seemed to be established.

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BOOK REVIEW

Explaining 'Teaching Machines' and Programming
by

David Cram, Fearon Publishers, San Francisco, 1961.

Price \$2.00, pp. 86.

This book considers in very elementary form two basic types of programming, taught to the reader as it would be in a programmed teaching machine. This book attempts to explain and contrast methods of organizing the students' learning experiences through the use of sequential steps involving directives, questions, and answers as would be required for a teaching machine lesson.

Essentially two types of programming are discussed—linear programming in which all students are required to follow the same sequence of steps until the lesson is finished, and branching programming in which each student may not follow the same path to the conclusion of the lesson but is permitted to make excursions into related areas for review or elaboration of the material being studied. Both constructed responses and multiple choice responses are considered by the author. Although some evidence suggests that the author wished to introduce psychological principles in support of each type of programming the result leaves much to be desired. One unfortunate and disturbing consequence of the book's organization is its reliance upon the principle of learning by doing. This disconcerting and often annoying approach is illustrated by the fact that what the author covers in thirty-four pages of programmed material is concisely explained in a one page summary. There is, however, an attempt to contrast both types of programming in terms of its effect upon learning and its relation to individual differences. Unfortunately no research data are used to substantiate the claims made.

If the reader's patience does not become overtaxed by the incessant necessity for flipping pages as directed by the author, the book will serve to introduce the topic in a most elementary form. Clear diagrams depicting the main methods of programming were found to be helpful. These alone can provide the beginning programmer with a basis for constructing initial programs for most teaching machines.

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BOOK REVIEW

MacArthur, R. S. and Lindstedt, S. A., *The Alberta Teacher Force in 1957-58*, University of Alberta, The Advisory Committee on Educational Research, Monograph Number Three.

This monograph reports factually the major findings of a survey made to provide the Alberta Royal Commission on Education with information on the characteristics of the teaching force in the Alberta public schools as of May 1958.

A 55-item questionnaire was distributed to the 9,500 teachers and principals. Returns were received from 99.2 p.c. and the data were punched on I.B.M. cards.

The data are marshalled into four sections; (i) Vital Statistics, including sex, marital status, age, number of dependents, and salaries; (ii) Professional preparation; (iii) Experience and mobility; and (iv) Relation of academic background to subjects taught.

The monograph presents the results in tables usually showing percentages or medians as well as numbers, accompanied by short explanations where required and brief statements of the principal points to be drawn from the tables. These statements by no means exhaust the information to be derived from the tables.

The tables follow a common pattern (a) totals by sex, (b) sex and marital status, and (c) sex and types of administrative unit—divisions or counties, cities, other independent districts.

Except for data on age and number of dependents those of Section II are similar to those in the Dominion Bureau of Statistics annual publication "Salaries and Qualifications of Teachers in Public Elementary and Secondary Schools".

The distribution of men and women teachers by age show different patterns. Proportionately, there is a pronounced difference between the numbers of younger women and men and a drop in the proportion of men of military age during the war is quite noticeable.

In addition to classification by certificate, Section III provides significant information on professional preparation in terms of high school graduation and years of further education. A much larger proportion of men than women teachers have 4 or more years of post-secondary education. And it may surprise some to know that more than one Alberta teacher in 5 was first certificated in another province and that almost half of these came from Saskatchewan. Incidentally, an explanation that Grade 12 in Alberta is senior

matriculation level should have been given early in Section III for the sake of readers not familiar with this fact.

The data show marked similarity in experience for teachers working under the three types of administrative unit. What it does not show is that secondary teachers have 4.5 years more experience than elementary teachers and that the median is lower, (naturally) for the rapidly growing metropolitan areas and lowest for the larger rural schools.

Here, for the first time, is information on lapses or interruptions in service. As might be expected interruptions in service were very largely among the women teachers. Almost 37 p.c. of all teachers with two or more years of experience have had breaks in service, marriage or maternity accounting for over 54 p.c. of them, and furthering of education for another 15 p.c.

To this reviewer the discussion on turnover seemed confused. First, the term is used with two different meanings and second, one figure from outside the data collected is vital to the presentation—the total number of teachers for 1956-57. Given that figure, and using the generally accepted formula, turnover would have come out to less than 25 p.c. A second set of calculations could have shown clearly the number of teachers lost by Alberta between the two years, the increase in staff and the acquisitions. It would then have been apparent that the 1957-58 staff was over 10 p.c. (not 5 p.c.) greater than that of the previous year—a rate of increase that was held since the fall of 1947—and the estimate of requirements for 1958-59 would have been more realistic.

Section V relates the academic background of teachers of high school grades to subjects taught for English, Social Studies, Mathematics, Physical Science, Biological Science, Home Economics, Art, and Physical Education. Close to 45 p.c. of the teachers of French, of mathematics, and of physical science to the senior high school grades had no more than one related university course beyond what they may have been teaching.

The monograph concludes with a summary of characteristics of "typical" teachers, a copy of the questionnaire, and numbers and per cent frequencies for each item.

This is an interesting and valuable study, particularly the sections concerned with professional preparation and the relation of this to subjects taught. It would be even more valuable had it presented some comparative data on the teaching staffs of other provinces.

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RECENT BOOKS

Bigge, M. L. and Hunt, M. P. *Psychological Foundations of Education*. Harper & Brothers: New York, 1962, pp. 530, \$7.50.

Tanner, J. M. *Education and Physical Growth*. Clarke, Irwin & Company Limited: Toronto 10, 1962, pp. 144, \$2.40.

Gordon, Ira J. *Human Development from 5 to 12*. Harper & Brothers: New York 16, 1962, pp. 400, \$5.75.

Gwynn, J. M. *Theory and Practice of Supervision*. Dodd, Mead & Company: New York, Toronto, 1961, pp. 473, \$6.75.

